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ALGEBRA.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

60. Proposed by ROBERT J. ALEY, A. M., Professor of Mathematics in Indiana University, Bloomington, Indiana.

Telegraph poles are a yards apart; for how many minutes must one count poles in order that the number of poles counted may be equal to the number of miles per hour that the train is running?

I. Solution by FREDERICK R. HONEY, A. B., New Haven, Connecticut.

The problem is independent of the number of poles counted, and of the number of miles per hour the train is running. We will call this number N.

$\therefore aN$=the number of yards the train runs while the poles are counted. Also, $1760N$=number of yards per hour the train runs. $\therefore aN/1760N$=the fraction of an hour during which the poles are counted.

$\therefore 60aN/1760N=3a/88$=number of *minutes* during which the poles are counted.

II. Solution by M. A. GRUBER, A. M., War Department, Washington, D. C.; and W. H. CARTER, Professor of Mathematics, Centenary College of Louisiana, Jackson, Louisiana.

Let x=the number of minutes, and let r=number of miles per hour the train is running. Also, $1760/a$=number of poles in a mile, and $rx/60$=number of miles the train runs in x minutes. Then, $rx/60\times 1760/a=88rx/3a$=number of poles passed in x minutes, or while the train is running $rx/60$ miles.

$\therefore 88rx/3a=r$; whence $x=3a/88$.

The number of minutes depends upon the distance the poles are apart irrespective of the rate of the train.

Also solved by *O. W. ANTHONY, P. S. BERG, A. H. HOLMES, C. D. SCHMITT, H. C. WILKES, B. F. YANNEY,* and *G. B. M. ZERR.*

61. Proposed by COOPER D. SCHMITT, M. A., Professor of Mathematics, University of Tennessee, Knoxville, Tennessee.

Demonstrate the identity $2^{2n+1}\dfrac{d^n}{dx^n}\left(x^{n+\frac{1}{2}}\dfrac{d^{n+1}}{dx^{n+1}}e^{\sqrt{x}}\right)=e^{\sqrt{x}}$.

I. Solution by O. W. ANTHONY, M. Sc., Professor of Mathematics in New Windsor College, New Windsor, Maryland.

It may be proved inductively that $\dfrac{d^n}{dx^n}e^{\sqrt{x}}=\dfrac{1}{4x}\dfrac{d^{n-2}}{dx^{n-2}}e^{\sqrt{x}}-(n-\frac{3}{2})\dfrac{d^{n-1}}{dx^{n-1}}e^{\sqrt{x}}$.

Change n to $n+3$; then

$$\frac{d^{n+3}}{dx^{n+3}}e^{\sqrt{x}}=\frac{1}{4x}\frac{d^{n+1}}{dx^{n+1}}e^{\sqrt{x}}-(n+\tfrac{3}{2})\frac{d^{n+2}}{dx^{n+2}}e^{\sqrt{x}}.$$